Electrolytic Cells.

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A galvanic cell is driven by a spontaneous chemical reaction. A spontaneous reaction is a reaction that occurs without needed external energy.

An electrolytic cell is a device that drives a non-spontaneous reaction. A non-spontaneous reaction requires a constant supply of energy to keep the reaction going. This energy in usually in the form of heat or electricity.

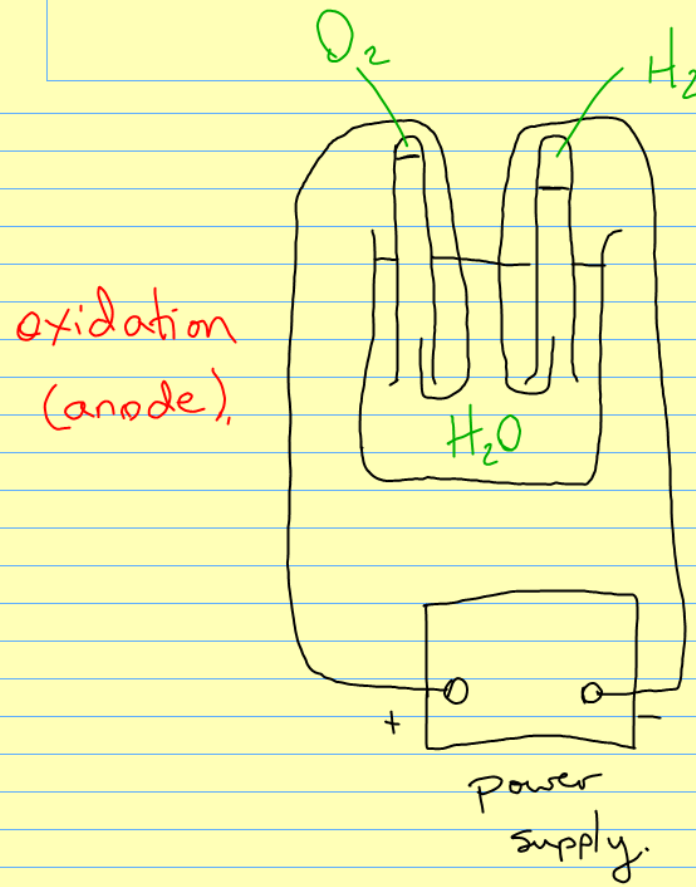
The process of driving a non-spontaneous reaction using electricity is known as electrolysis. Electrolysis can be used to force water to decompose into hydrogen and oxygen gas:

$$2\,\overset{1+}{H}_2\overset{2-}{O} \longrightarrow 2\overset{0}{H}_2 + \overset{0}{O}_2$$

In this reaction the hydrogen is reduced while the oxygen is oxidized.

red: $2H^+ + 2e^- \longrightarrow H_2$

ox: $2O^{2-} \longrightarrow O_2 + 4e^-$



oxidation (anode),

reduction (cathode)

cations (+)

anions (−)

Just like a galvanic cell reduction occurs at the cathode and oxidation at the anode.

Galvanic Cell	vs	Electrolytic Cell
- chemical reaction is spontaneous		- chemical reaction is non-spontaneous.
- produces electricity		- consumes electrical energy
- converts chemical energy to electrical energy		- converts electrical energy into chemical energy
- oxidation at anode, reduction at cathode		- oxidation at anode, reduction at cathode
- electrons flow from anode to cathode		- electrons flow from anode to cathode
- anions move toward the anode cations toward cathode		- anions move toward anode, cations toward cathode.

P432 Q 1, 2, 3, 4, 5, 6, 9.